

2. On the Convoluted Trachea of two Species of Manucode (*Manucodia atra* and *Phonygama gouldi*) ; with Remarks on similar Structures in other Birds. By W. A. FORBES, B.A., Prosector to the Society.

[Received March 21, 1882.]

The subcutaneous convolution on the pectoral muscles of the trachea in the Manucodes of the genera (or subgenera) *Manucodia* and *Phonygama*, originally described and figured by Lesson in *Phonygama keraudreni* so long ago as 1826<sup>1</sup>, has lately excited considerable attention, Prof. Pavesi<sup>2</sup> having shown that a similar structure, though less developed, exists in *Manucodia chalybeata*, and Dr. Meyer<sup>3</sup> having demonstrated the same for its representative form *M. jobiensis*. From their figures and observations it is clear:—

1. That the trachea of *Phonygama* "*keraudreni*"<sup>4</sup> may be convoluted in both sexes, that of the males being most complicated, consisting, when best developed, of a complete spiral of several coils, whilst in younger males, and females, it is reduced to a simple loop with a bend to the right.

Intermediate forms of all kinds are to be found, as shown by Pavesi's interesting series of figures.

2. That in *Manucodia chalybeata* and *M. jobiensis* the adult males possess a trachea provided with a simple loop, extending about two thirds down the surface of the pectoral muscles. This is apparently absent in the females and young males.

The specimen, a male, of *Manucodia atra*, purchased by the Society on March 19, 1881<sup>5</sup>, having died on March 11th inst., I have now been enabled to examine the condition of the trachea in this species also. As will be seen from the drawing I exhibit (figure, p. 348), representing it *in situ*, it too is convoluted, but to a much smaller extent, only forming a short loop lying on the interclavicular air-cell, between the rami of the furcula, much as in many specimens of the genus *Crax*. This quite confirms D'Albertis's description given by Count Salvadori<sup>6</sup>. In the female the trachea will probably be found to be quite simple.

Of *Phonygama gouldi*, the Australian representative of *P. keraudreni*, I have been enabled to examine three detached tracheæ, as well as three entire birds collected at Cape York by H.M.S.

<sup>1</sup> Voyage de la 'Coquille,' Atlas, pl. xiii. fig. 2.

<sup>2</sup> Ann. Mus. Genova, vi. pp. 313-324, pl. x., and ix. pp. 66-77.

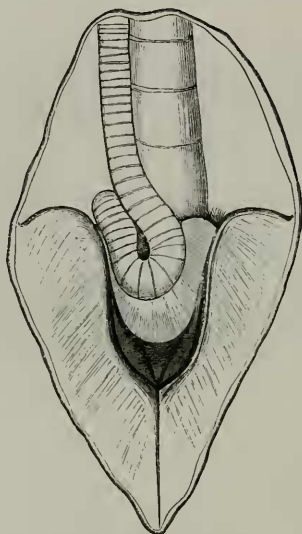
<sup>3</sup> Abbildungen Vogel-Skeleten, pl. vii. a, p. 5.

<sup>4</sup> All but one of Pavesi's specimens (fig. 6 of his second paper) are, it is to be observed, really *P. gouldi*, having been obtained at Cape York by D'Albertis.

<sup>5</sup> On its arrival it was supposed to belong to the species *M. viridis* (scu *chalybeata*), and was noticed as such (P. Z. S. 1881, p. 450).

<sup>6</sup> "Non pare che questa specie possegga vere circonvoluzioni esterne della trachea, ma, secondo le osservazioni del D'Albertis, i maschi adulti avrebbero soltanto un'ansa piegata ad S nella fossetta della forchetta."—*Ornitologia della Papuasia e delle Molucche*, ii. p. 509.

'Challenger,' and kindly intrusted to me by the late Sir Wyville Thomson. The first three are those already mentioned by Mr. Tegetmeier in his appendix to the 'Natural History of the Cranes'<sup>1</sup>. All are convoluted, though that of the female specimen is least so, and those of the two males vary slightly in the amount of convolution. They very closely resemble that of *P. keraudreni* figured on p. 68, fig. 2, in the second of Prof. Pavesi's papers already quoted, but have eight instead of nine folds, counting along a transverse line drawn through the centre of the coil. Of the three 'Challenger' birds, one, a female<sup>2</sup>, has a trachea with a single curved loop, like Pavesi's fig. 8, whilst in the two others the trachea is



Trachea of *Manucodia atra*.

quite straight, with no trace of a curve. One of these is a *male*, probably young, whilst the other is an *adult* female, as shown by the oviduct containing an egg nearly ready to be laid.

It is clear therefore that in this species, too, the female *may* sometimes have no tracheal loop at all.

As regards the habits of *P. gouldi*, I reproduce here some extracts from the notes accompanying the receipt of the first three tracheæ sent—I believe, by Dr. George Bennett of Sydney—the substance of which Mr. Tegetmeier has already published (from the original MS. in my possession) in his work on Cranes:—

<sup>1</sup> London, 1881, pp. 87, 88.

<sup>2</sup> One of the specimens referred to in Mr. Murray's notes, *cf.* 'Voyage of H.M.S. Challenger,' Report on the Birds, p. 87.

"Having recently purchased a pair of those elegant birds, the *Manucodia gouldi*, which had been shot at Cape York by Mr. J. A. Thorpe (now taxidermist to the Sydney Museum), he directed my attention to the peculiar formation of the trachea in them, some of which he has preserved in a dried state and presented to me; of these I have sent you three, one from a female and two from males. That of the female is much smaller in size than those of the males; and even in the males the convolutions assume different forms. This formation of the vocal organs enables the male bird to utter a very loud and deep guttural sound, indeed more powerful and sonorous than any one would suppose so small a bird could be capable of producing. Mr. Thorpe states to me that it was a long time before he could believe that so powerful a sound emanated from this bird. No information could be obtained respecting the note of the female, as only that of the male was heard. These birds were found about the same locality as the two fine species of Rifle-birds obtained also at Cape York—*Ptilorhis alberti* and *P. victoriæ*.

"Mr. Thorpe gave me some information respecting the habits of these birds as follows:—'During a residence of seventeen months at Cape York in 1867 and 1868 I shot several of the *Manucodia gouldi*, and took particular notice of their habits. They frequent the dense palm-forests, and are usually seen high up in the trees; they utter a very deep and loud, guttural note, rather prolonged, and unlike that of any other bird with which I am familiar. Their movements are particularly active and graceful; on approaching them they evince more curiosity than timidity, looking down at the slightest noise, and apparently more anxious to obtain a full view of the intruder than for their own safety. They are almost invariably in pairs; and both birds can generally be secured.'"

I may remark that, in all the specimens of the convoluted trachea in *Manucodia* and *Phonygama* I have seen, the descending limb of the loop in the natural position of the bird is to the left, the ascending to the right. The same peculiarity is observable in all the figures yet published, excepting the original one of Lesson, and in one of those of Pavesi (*l. c.* ix. p. 64, fig. 4). The reversal, in the first figure, is obviously due to the trachea being represented from the dorsal, instead of the ventral aspect, it being represented as quite separated from the body: Pavesi's figure, representing the parts *in situ*, does not admit of this explanation, if correctly drawn.

As regards the two forms *Phonygama* and *Manucodia*, which Mr. Sharpe adopts as genera in the 'Catalogue of Birds,' vol. iii. pp. 180, 182, it is interesting to observe that the validity of the separation is confirmed by what we now know of the tracheal conformation of the two groups in question.

*Phonygama* (as represented by *P. keraudreni* and *gouldi*) has the trachea (at least usually) convoluted in *both* sexes, that of the adult male being spirally convoluted several times, whilst that of the female forms a single curve with a loop to the right. *Manucodia* (in *M. chalybeata*, *jobiensis*, and *atra*), on the other hand, has the trachea convoluted in the male only, the convolution being in the form of a

simple loop, extending, in the first two species, onto the pectoral muscles, but confined in *M. atra* to the interclavicular area.

As regards the occurrence of convoluted tracheæ in the class Aves generally, it may be useful to give as complete a list as is in my power of all the hitherto recorded instances. Pavesi has already (*l.c.* vi. pp. 317, 318) given such a list, compiled from various authors; but the opportunities for observation of my predecessor and myself have enabled me to give, as will be seen below, a much fuller and more complete one. I have endeavoured to state exactly in what species this convolution has been observed, or has been found to be absent, as well as to state precisely the sexes of the individuals presenting the peculiarities. Unless otherwise stated, the observation has been made by Prof. Garrod or myself.

- A. The convolutions of the trachea are superficial, lying beneath the skin, extending often more or less onto the pectoral, or even abdominal, muscles.

#### OSCINES.

- Phonygama keraudreni*. ♂ [Lesson, Pavesi, Meyer]. [Probably ♀ also.]  
 ——— *gouldi*. ♂ : present, much less developed (sometimes absent) in ♀.  
*Manucodia chalybeata*. ♂ [Pavesi, Meyer].  
 ——— *jobiensis*. ♂. [Condition in ♀ not known.]  
 ——— *atra*. ♂. [Condition in ♀ not known.]

At present it has been found in the males only of these three species, and, as already indicated, is, from Beccari's observations on *M. chalybeata*, probably absent altogether in the females.

#### Fam. ANATIDÆ.

In the males of *Anseranas melanoleuca* the trachea forms a very extensive double loop, extending to quite the end of the pectoral muscles. The female has simply a slight bend in the neck.

#### Fam. SCOLOPACIDÆ.

The *females* only of *Rhynchæa australis* [according to Gould] have a convoluted trachea, forming several folds on the pectoral muscles, and extending onto the abdomen. In the *males* it is simple<sup>1</sup>.

In *R. capensis*, as Mr. Wood-Mason has lately shown (*P. Z. S.* 1878, pp. 745-751, pl. xlvii.), the mature females only have a slightly extrathoracic loop, the trachea of the younger females and of the males being quite simple.

<sup>1</sup> Two specimens showing different degrees of development of this structure may be seen mounted in the Hunterian Museum (Preps. 1156, D & E).

## Fam. CRACIDÆ.

In the males of the genera *Crax*, *Pauxis*, *Mitua*, and *Ortalis* the trachea forms a loop of variable extent, often extending, particularly in the last three genera, to the end of the *carina sterni*, and then turning up a little way on the left side before it returns. In other cases it extends only about as far as the anterior end of the *carina*. In the females this loop is altogether absent, or at most the trachea presents a slight curve in the neck.

*Species examined.*

*Crax globicera*. ♂, ♀.

—— *alector*. ♂, ♀.

—— *sclateri*. ♂, ♀.

—— *daubentoni*. ♂, ♀.

—— *alberti*. ♂, ♀.

—— *carunculata*. ♂, ♀.

[The females only of *C. globulosa* and *C. incommoda* have yet been examined. The trachea is simple.]

*Pauxis galeata*. ♂, ♀.

*Mitua tuberosa*. ♂, ♀.

—— *tomentosa*. ♂, ♀.

*Ortalis albiventris*. ♂, ♀.

—— *garrula*. ♂. [The ♀ according to Humboldt<sup>1</sup> has the trachea simple.]

—— *motmot*. ♂. [The female has a simple trachea according to Latham, who describes this species<sup>2</sup> under the name of *Phasianus parraka*.]

In *Penelope jacucaca* the trachea is convoluted in *both* sexes; and the same is the case in the male of *P. pileata*, the condition of the female being unknown.

[In *Penelope cristata* and *P. purpurascens* the male has *no* loop; and the same is the case in *Pipile cumanensis* and *P. jacutinga*. Only females of *Pipile cujubi* and *Nothocrax urumutum* have yet been examined: these had simple tracheæ; and the same is the case in *both* sexes of *Aburria carunculata*.]

B. The trachea has a considerable superficial loop in the cervical region, anterior to the thoracic muscles.

## Fam. PHASIANIDÆ.

*Tetrao urogallus*. The male only, apparently.

C. The trachea has a loop entering into, and inclosed by, a bony cavity formed by the clavicular symphysis.

## Fam. NUMIDIDÆ.

The Guinea-fowls of the genus *Guttera*, as seen in both sexes

<sup>1</sup> Humboldt and Bonpland, 'Recueil d'observations de Zoologie,' &c. p. 5. Paris, 1811.

<sup>2</sup> Linn. Trans. iv. p. 100 &c.

of *Guttera cristata* and *G. pucherani*. The same conformation occurs in *G. eduardi*; but the sex of my specimen is not, unfortunately, recorded.

[In *Numida* proper (*N. meleagris*, *ptilorhyncha*, and *mitrata* have been examined), as well as in *Acryllium vulturinum*, the trachea is quite simple in both sexes.]

D. The trachea has several *intrathoracic* convolutions.

Fam. CICONIIDÆ.

*Tantalus ibis*, in the male (cf. Garrod, Coll. Papers, p. 286).

[The condition of the female is unknown.]

[In both sexes of *T. loculator*, as well as in the females of *T. leucocephalus* (the other sex not yet having been dissected) the trachea is unconvoluted.]

Fam. IBIDIDÆ.

*Platalea leucorrodia*. ♂. (♀, Nitzsch).

[In *Ajaja rosea* the trachea is known to be simple in both sexes, though the bronchi are peculiarly long. Cf. Garrod, *l.c.* p. 288.]

E. The trachea is convoluted, the convolution impinging on, or entering, the *carina sterni*.

Fam. CYGNIDÆ.

In the Swans of the *Cygnus ferus* group, the trachea, as has long been known, has a number of *intrasternal* convolutions, which may extend to near the end of the bone.

This is well known to occur in both sexes of *Cygnus ferus*: it is likewise the case in both males and females of *C. buccinator*, *C. americanus* (according to Macgillivray, Sharpless, &c.), and *C. bewicki* (Yarrell).

[In *Cygnus olor*, *C. immutabilis* (Macgillivray), *C. nigricollis*, and *C. coscoroba* the trachea is quite simple in both sexes.]

According to Yarrell, in *Cygnus atratus* there is a slight downward-directed loop of the trachea in the interclavicular region.

Fam. GRUIDÆ.

The genus *Grus*, as a rule in both sexes, possesses a convoluted trachea, which usually enters the *carina sterni*, which it may excavate to its posterior extremity. The amount of convolution varies much in different specimens of the same species.

*Species examined.*

*Grus cinerea*. ♂, ♀. (Yarrell, &c.)

— *antigone*. ♂ (Tegetmeier). ♀.

— *americana*. ♀ (cf. Roberts, Am. Nat. 1880).

— *carunculata*. ♂, ♀.

— *leucogeranos*. ♂, ♀.

As regards these two species, it appears from Prof. Garrod's MS.



notes that the male of *G. leucogeranos* has a convoluted trachea, only slightly folded in the *carina sterni*, extending in it for less than half its extent<sup>1</sup>; whilst in the female "there was formed a genu of small size, that does not enter the *carina sterni*." The female of *G. carunculata* examined had a trachea as well convoluted as the most developed forms of *G. americana*, whilst in the male the condition was as in the female of *G. leucogeranos*.

*Grus australasiana*. ♂ [? ♀].

— *canadensis*. ♂.

In *Tetrapteryx paradisea*, according to Yarrell and Tegetmeier, as well as in *Anthropoides virgo* according to Parsons and Yarrell, the trachea is convoluted, but does not enter the *carina sterni*, being contained in a special groove developed along the anterior margin of that bone.

[In both species of *Balearica* the trachea is known to be quite simple; and the same is probably true in *Aramus scolopaceus*.]

### 3. On the Eggs of some rare Wading Birds from Madagascar.

By J. E. HARTING, F.L.S., F.Z.S.

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Amongst a large collection of eggs recently brought from Madagascar by the Rev. W. Deans Cowan, many of which are of considerable interest as being hitherto undescribed, are the eggs of three species of *Limicolæ* which I should like to bring before the notice of this Society, since they belong to members of a group to which I have for some years been paying special attention.

Mr. Deans Cowan collected in the neighbourhood of Fianarantsoa in the Betsileo country, situated in the south central portion of Madagascar; and the extent of his collection shows how rich a field for ornithologists is the district in which he has for some years resided.

The three species of Wading-birds of which I now exhibit the eggs, as well as the skins, are a Pratincole (*Glareola ocularis*, Verreaux), a Sand-Plover (*Ægialitis geoffroyi*, Wagler), and a Snipe (*Gallinago macrodactyla*, Bonaparte). The Pratincole and Snipe, which so far as I am aware have not been met with out of Madagascar, are both very rare in collections; the Sand-Plover, being generally distributed throughout Southern Asia, the Malay Archipelago, and Eastern Africa, is very much better known.

1. *GLAREOLA OCULARIS*, Verreaux, was first brought to the notice of naturalists by the late Jules Verreaux so long ago as 1833, when at a meeting of the South-African Institution at Cape Town in that year he exhibited and described a specimen, which, with other skins, he had then lately received from Madagascar.

<sup>1</sup> The observations of Mr. A. O. Hume (*cf.* Tegetmeier's 'Cranes,' p. 39, &c.) do not, therefore, always hold good for this species.